THE METAL INDUSTRY

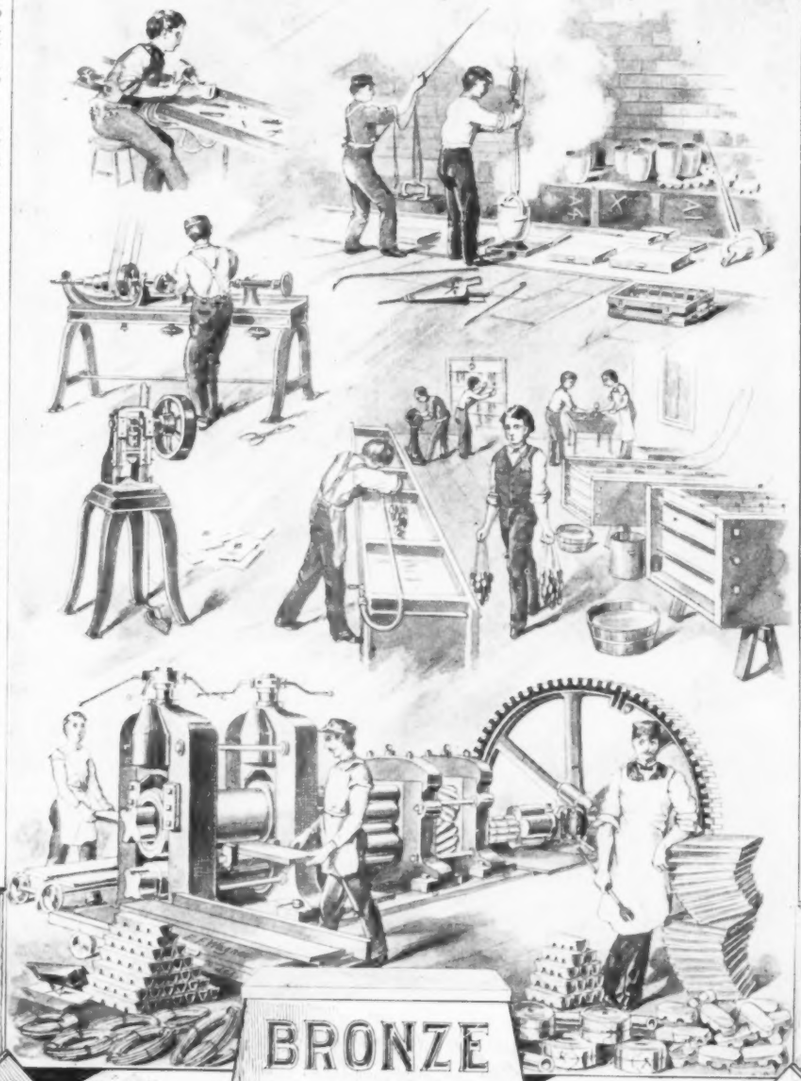
WITH WHICH IS INCORPORATED THE ALUMINUM WORLD.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

ALUMINUM · COPPER · NICKEL · TIN · SILVER · LEAD · GOLD · ZINC

METALLOGRAPHY · BRASS · METALLURGY

ROLLING · DRAWING · STAMPING · SPINNING · TUBE MAKING · SOLDERING · MELTING · CASTING · BLOWING · ANNEALING · BRONZING · PLATING



BRONZE

OLD SERIES
Vol. IX., No. 4
NEW SERIES
Vol. I., No. 4

LABOR OMNIA VINCIT

APRIL, 1903

NEW YORK.

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Entered February 10, 1903, at New York, N. Y., as second-class matter under act of Congress, March 3, 1879.

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The Metal Industry
AND
The Aluminum World

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THE METAL INDUSTRY PUBLISHING COMPANY,

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ADVERTISING RATES ON APPLICATION

Entered February 10, 1903, at New York, N. Y., as Second Class Matter Under Act of Congress March 3, 1879.

WILL HISTORY REPEAT ITSELF?

The metal situation is now undergoing one of those spasmodic conditions which the consumer is periodically forced to face. Whether the present price of copper is justified by an actual increasing demand for the metal or has been culminated by bull movement on the part of the operators, remains to be demonstrated. On the one side it is claimed that the copper accumulation of the last zenith of prices has been reduced to commercial proportions; on the other, a false inflation of values has been attempted in order to place the value of stocks at a lucrative selling figure. If the former, the price of copper is likely to remain where it is for some time; if the latter, it is probable that copper will go to a figure much higher than that at present, but only to fall as it did during that previous memorable period.

This high price of copper is not without its reaction, however. The aluminum producers invariably profit by such conditions, and we believe that such forced consumption of this metal is sure to work very favorably for the producers. With copper on a nearly equal basis or slight increase in cost, there is little tendency to investigate the substitution of aluminum, but with a great disparity in values, uses are found from which the consumer is not liable to return. The scrap metal industry also receives a stimulus as copper advances. Driven by the fact that he cannot get a greater price for his goods, the manufacturer naturally enters the scrap market with considerable vigor, which not only renders the demand for scrap lively, but enables the dealer to dispose of material at a good profit, which otherwise he would not be able to do.

The soaring in the price of tin can scarcely be classed with that of copper. The present price is, without doubt, a false inflation, brought about by certain contemplated movements intended solely for the purpose. The demand for tin can hardly be called more than a healthy growth, while the demand for copper has kept pace with that of electrical equipments. The price of tin appears to resemble the display of pyrotechnics rather than that of any result of demand. The consumer eventually pays for these high values, but in the meanwhile the manufacturer

is obliged to accept the inevitable. The price of his wares never keeps pace with the metal market. The conditions have to be met before they are vanquishd.

THE DIRECT ROLLING OF COPPER AND BRASS.

For some time the practice has been followed in certain lines of the steel industry of rolling the ingots directly with their initial heat. After being dumped from the molds they are put in the so-called Gjiers soaking pit, to allow the heat to become uniformly distributed, and are then rolled. This process saves both time and fuel, as the heat left in the metal is utilized.

This method is now being tried in the copper trade, and Mr. T. H. Martin, formerly manager of the Morfa Copper Works, at Swansea, Wales, is the inventor of the process whereby this process may be successfully carried out in the copper industry. The copper is cast in specially constructed molds (and herein appears to lie the novelty of his invention), which enables it to be expeditiously removed. The cake or bar is then directly rolled. Beyond the actual saving in time and fuel, much is claimed for the process, notably the loss through scaling and liability of burning in the heating furnace. A much more uniform and perfect product is said to be obtained. This process appears to be yet confined to Great Britain, as we know of no mill in the United States which uses such a method.

IMPURE NICKEL ANODES.

There is a rumor that the manufacturers of nickel anodes are again about to organize. Their association collapsed in 1902, and the condition of the nickel anode business now beggars description. Competition invariably tends to reduce quality, and it certainly has in the nickel anode industry, for it is doubtful whether a pure nickel anode is actually sold at the present time. We have found anodes to contain all the way from 8 to 15 per cent. of iron, added, of course, for the purpose of cheapening the cost. The competition becoming more brisk rendered the addition of iron necessarily greater, so that if conditions keep going from bad to worse we shall expect to see an anode actually containing more iron than nickel. One maker has advanced the statement that the iron is added for the purpose of hardening the nickel, which, in its pure state, is too soft. This is in this statement not even "food for reflection," for nickel itself is one of the hardest metals and gives a hard, tenacious deposit. An electro-plater of wide reputation informed us only a few days ago that he longed for the time of the rolled anode—a relic of bygone days. When very particular work is required, he is accustomed to bring out some of these pure anodes and use them in the bath. The results warrant the trouble.

The iron in a nickel anode is injurious, beyond the fact that a nickel price is paid for iron. We recently saw a bath in which there was not less than six inches of solid precipitated iron hydroxide in the bottom of the tank. The anodes become covered with a thick deposit through which the solution cannot act, and the precipitate floats over on the work.

Great care is exercised in the employment of silver anodes to avoid any contamination of the bath from precipitates, and the same should apply to nickel; the principle is the same. The silver anode is now undergoing a betterment, and we predict that the same must eventually come with nickel. As it is now, the electro-plater accepts the inevitable; he is powerless to ameliorate his condition.

AMERICAN ELECTROCHEMICAL SOCIETY.

The third general meeting of the American Electrochemical Society will be held in New York City April 16, 17 and 18. The members will make their headquarters at the Chemists' Club, 108 West Fifty-fifth street. Among the papers which will be read and discussed are: "The Corrosion of Metals by Electrolysis," by A. A. Knudson; "Modern Electrolytic Copper Refining," by Titus Ulke; "A Note on the Corrosion of Electroplating Solutions," by N. S. Keith; "Electrolytic Production of Metallic Compounds," by Prof. C. F. Burgess and Carl Hambuechen; "The Electrodeposition of Metals Upon a Rotating Cathode," by J. G. Zimmerman; "Electromotive Force of Alloys," W. D. Bancroft, and "Exhibit of Aluminum Corrosion," by J. A. Steinmetz. The president of the society, Dr. Joseph W. Richards, will deliver an address. Luncheons, excursions and smokers are also provided for in the programme. The meeting, therefore, promises to be both pleasurable and instructive.

THE MOLDING MACHINE IN GREAT BRITAIN.

Our English cousins have always been slow in adopting labor-saving devices and we therefore note with pleasure the firmness with which the molding machine has made its way into England. The Tabor machine appears to have found a ready sale in that country, not only on account of the ease with which it is manipulated, but the cheapness of the patterns which are used in connection with it. The statement is made that simple split wood patterns and a paraffined board are all that are required for this part of the equipment. The entire cost of making this need not, for an ordinary battery, exceed 80 cents. Comparison of this with the cost of making the ordinary style of pattern for former types of molding machines, which often reached close to $100, easily indicates the future of this machine.

THE BIRMINGHAM BRASS COMPANY RESUMES OPERATIONS.

Some time ago this company closed their mill and went out of business. The plant was then purchased by the Coe Brass Company, of Torrington, Conn. Except for a couple of months during the summer of 1902, when the plant was rented to the Seymour Manufacturing Company, the mill has not been in operation. The mill is now in full operation, however, with a complete complement of hands. While the management is non-committal, there are rumors to the effect that the operation of the plant is only of short duration, as it is being run to take the overflow of the Torrington plant. The Birmingham plant, however, will be operated as long as this condition continues.

CORRECTION.—Through a typographical error in our last issue the composition of the one-cent pieces of the United States was erroneously given. The mixture is copper, 95 per cent.; tin, 2.5 per cent., and zinc, 2.5 per cent.

HIGH GRADE SPELTER AND SOME OF ITS FAULTS

By Winslow Goodwin.*

The consumption of spelter in the production of artistic metal work runs into a considerable figure in quantity, and particularly in value, as high-grade spelter is used exclusively. Its use ought to increase in natural growth of business expansion and because of the fact that American manufacturers are making rapid progress in the art of producing really excellent work which, of course, serves to displace merchandise heretofore imported from Berlin and Paris. A broad, liberal and consistent policy on the part of the miners and refiners is without question a necessary correlative of a larger use. From spelter statuettes, clocks and clock trimmings, vases and bric-a-brac, lamps and parts of the same and many other articles

TYPE OF DIFFICULT SPELTER CASTING.

can be produced. Most of the imported bronzes finished in Barbidienne and kindred colors, and popularly supposed to be "solid bronze," are made from spelter. The metal has advantages over certain others which at once commend themselves. It has a degree of strength not possessed by its nearest rivals in cost. It can be buffed and polished to a highly lustrous degree and is plated and oxidized readily in any of the popular finishes.

However, there is a curious diversity of opinion in this country among manufacturers of this class of goods as to the respective merits of spelter and its closest rival, the lead and antimony mixture. Many large manufacturers of fancy goods confine themselves wholly to the use of lead and antimony, while others in identically the same line use spelter for the same kind of work. The lead and antimony mixture has, of course, strong claims for recognition. It runs sharply, thanks to the antimony bringing out the finest details of chased and matted surfaces, but for gold-plated articles it does not afford that brilliancy and beautiful lustre which well finished spelter work exhibits. Of course, every maker of spelter goods is obliged to use other mixtures on certain classes of work, and perhaps the policy of one well-known firm in Connecticut, which uses both metals in considerable quantities, is a wise one. On the other hand, another concern, perhaps the best known in this country for the high excellence of its product in artistic metal lines, confines itself almost wholly to the use of spelter and is probably the largest individual consumer in America for the purpose mentioned.

These preliminary observations, however, merely lead up to the question, and this question is not the discussion of which is the better material, but is as to why spelter is not more generally used. I have for the past twenty years had a more or less intimate knowledge of its workings, oftentimes to my sorrow. It is a refractory metal and cannot be depended upon at all times to give the desired results. At one time a consignment of metal will work beautifully. It will run with fluidity, be free from excessive shrinkages and the surface of the castings will be soft and even, without "cold shots" or other blemishes. The next carload of precisely the same brand may be astonishingly unlike its predecessor. The castings will crack so badly at times as to fall apart when taken from the mould. The metal will flow sluggishly and the lighter parts of thin castings will refuse to unite or run together and on "slushed" work the castings are made prohibitively heavy. Again, the metal when in this condition refuses to part with its entrained gases, the result of which contingency is only too well known to the plater, who often is blamed for an unhidden green spot which in time appears on the surface just above the cavity left by the confined gas.

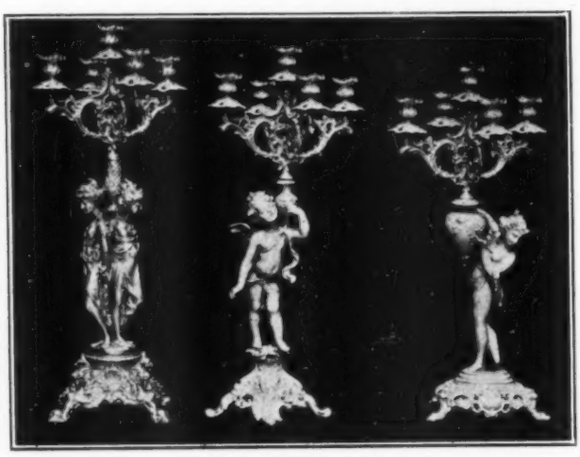
The reason for this ununiformity in quality can, in my opinion, be located. Analysis, as an index to quality, is not to be depended upon. The sales agents have refused to have their products judged by analysis, claiming that there are qualities contained in the spelter which the analyst cannot discover, and in this connection I believe they are justified. Leading authorities in iron foundry practice have adopted identical views. Taking it for granted, then, that the man of science is unable to locate the reasons for this variance in quality, it seems to me that the only recourse is to call to our aid the practical refiner or furnace manager. Years ago the writer about completed arrangements with the manager of one of the large spelter producing interests to send to their furnace an experienced spelter caster with a number of moulds of various difficult kinds and shapes in order that the practical man at the furnace could compare notes with the "man behind the mould." For some reason the manager failed to carry out this idea. Had he followed it up, I am sure his refiner would have learned much of benefit to himself, his principals and the spelter consuming interests in particular.

I have been told by a gentleman well known as a refiner of spelter, and, in fact, the originator of a leading brand, that it is possible to produce, at a good profit, pure spelter of the highest grade from almost any ore, providing the refining is done properly and under right conditions. There are low grades of spelter on the market which are far superior to the best brands in some particulars, notably for running into fine light castings, but in other qualities they are lacking, oftentimes showing faults which I believe could be eliminated, if carefully studied.

*The Goodwin & Kintz Co., Winsted, Conn.

One kind I have used is absolutely preferable to the best known brands in fluidity, and, in fact, general behavior, but in passing it through an alkali bath, preparatory to plating, it becomes pitted with small holes, showing the presence of some element readily and unevenly affected by alkalies. Of course, this paragraph is written with full knowledge of the fact that spelter is dissolved in potash or soda, but the phenomenon here referred to was an unusual manifestation. I have before me two pieces of spelter broken from slabs taken from one consignment. One shows the characteristic lamellar crystalline fracture of commercial pure spelter, and is beautifully uniform in structure. The other reveals fine, close-grained crystals, indicating a fault. What causes this fault is not for the consumer to say, but the reason for it ought to be apparent at the furnace.

Spelter showing the eccentricity of fracture does not work properly, and generally cracks excessively. I am aware that usual tests of metal are often scoffed at, but the subject is just now having careful study in the steel trade, and the results are being classified and recorded. We all know that every experienced iron founder de-



COMBINATION BRASS AND SPELTER CASTING.

pends largely on the appearance of the fractured pig when buying iron.

Perhaps the spelter producer has been relying too much on science and too little on "rule of thumb," and the study of fractures may be a profitable field. This article is not written as an arraignment of the spelter-producing interests, but it is intended rather as a plea for their co-operation in the betterment of their output. The faults referred to tend to restrict the use of spelter, and have done much to bring it into disrepute. Better spelter will insure better castings, which will lead to less breakage and less of that troublesome spotting, which has done so much to injure the sale of spelter art goods.

That the quality of the metal can be improved, the writer has no doubt. Its production is highly profitable, and there is no financial reason why the output should not be carefully selected and properly handled. Whether a larger use would justify the expense is a question for the spelter producer to decide. Another factor in comparing its value with that of other metals is the one of cost. The unit weight of the usual lead and antimony mixture is about 50 per cent. greater than that of spelter, hence to be on a parity as to cost the selling price of spelter should be about 50 per cent. more than that of lead and antimony. A medium grade of spelter, suitable for the cheaper kinds of castings and competing reasonably with lead and antimony in value, has been marketed, but a constant supply cannot be depended upon, so that it must be considered as a negligible factor by large consumers.

Spelter is so exceedingly refactory in behavior, variable in quality and presents so many different and puzzling freaks in handling that men of intelligence are necessary to produce the best results in the casting room. Not alone has the varying quality of the metal to be considered, but each and every mould should have especial and particular study. The degree of temperature of the molten metal must be carefully noted and made to conform to the requirements of the particular work in hand.

A point for consideration is as to how the mould should be held, and whether it should be poured at one angle or another in order to get sharp, clean castings and to permit ready escape of the pent up gas, which, if confined in the castings, leaves a hidden cavity, resulting after plating in a serious blemish, due to the working out of the cyanide through the grain of the metal. The contents of the crucible must be carefully fluxed and the dross removed, as the presence of dross in a casting is fatal to perfect work. If slushed castings are being made, the proper weight must be carefully followed, otherwise a caster can quickly waste a quantity of valuable metal. These and many other points involving intelligent discrimination require that the spelter caster be a man of ability and good judgment. Really first-class men are scarce and command good pay. Furnaces with good draft are necessary, and the metal should be melted in graphite crucibles. In our work, we use the ordinary brass-melter's crucibles, but in many shops shallow pots or coloring bowls are preferred. Spelter melts more quickly in an iron pot, but the well-known disposition of spelter to attack iron soon destroys the pot and introduces into the spelter an element which is not desirable.

The spelter refiners learned their lesson in this particular phase years ago, and why they did not warn their customers against the use of iron melting pots is something I cannot understand. Its harmful effects were certainly known to them, but for a long time the custom certainly worked as much harm to the refiner as it did to the consumer.

A phase of the spelter question which is of considerable interest is as to the employment of alloys. We have used aluminum, but its value I consider as uncertain. At times and under certain conditions, if handled intelligently, it will certainly prove a benefit, rendering the metal more fluid and less liable to crack, but again, under seemingly identical conditions, no benefit can be noted. Pure ingot aluminum must always be used. A well-remembered episode involved the use of some aluminum scrap which had been alloyed by its makers, a fact which was overlooked until the annoying shrinkage displayed compelled a search for its cause. The propositions should be adapted to the work in hand, and but a small percentage used, as too large an addition will make trouble in the plating room.

A trade tradition to the effect that German manufacturers in our line alloy their spelter has caused us much speculation. A pioneer firm in the spelter-casting line, doing business in New York City for many years and composed of Germans who had learned their trade in the Fatherland, are said to have used tin as an alloy, and I have repeatedly heard this assumption, both in reference to this firm in question and European manufacturers in particular. How they were able to do this I cannot understand, as the presence of the smallest modicum of tin in a hundred pounds of spelter is usually enough to spoil the entire quantity. Perhaps some reader can enlighten us as to these points. The Bidri or Biddery metal of the East Indies was made of a small proportion of copper, tin and lead melted together, one part of which was added to five parts of spelter. I do not know whether this has ever been tried in this country in a commercial way or not.

Little has been written on the subject of spelter, and that little refers to its metallurgy, but it seems to me to afford a fertile field for discussion and research along the lines laid down in this article.

ELECTRIC WELDING OF TROLLEY WIRE.

Electricity is such a mysterious power, and mystery invariably lends such enchantment in the metal industry that it is not surprising that the welding of copper trolley wire should have been undertaken early in the history of the electric welding machine. It may safely be said in this connection, however, that there probably was never a machine in the history of the brass and copper business which held out as much promise and accomplished as little as the electric welding machine.

There was from the very beginning of the use of copper trolley wire an urgent demand for this product in long lengths. At first the length of the coil of wire was limited to the size of the copper bar from which the wire was made. The usual size of such bars is about 140 pounds, so that a coil of trolley wire corresponding to this weight was the maximum length which could be used. The demand for a longer length became so strong that the custom was started of brazing the scarfed ends of two coils of wire with silver solder. This practice, while satisfactory in many respects, has its drawbacks. The conductivity of the wire at this junction is limited to that of the silver solder, and therefore, is very much lower than that of the copper. The strength of the joint, too, is liable to be more or less deficient, depending upon the care with which the operation is done. These several obstacles seemed to disappear in the eyes of the trolley wire manufacturers when the electric welding process was launched. Trouble was not experienced in welding and the process appeared to be quite promising. The joint looked well, the labor was much less than in brazing and, above all, the conductivity of the copper remained intact. Complaints were soon heard, however, of wire breaking in the joint and later these complaints became numerous and investigation proved that the wire at the weld was quite deficient in strength. The structure appeared to lack that fibrous nature so characteristic of good copper and possessed one which is called in the copper industry "dry"; that is, short and lacking grain. It soon became apparent that the copper had become burnt during the welding operation, and burnt copper is always deficient in strength and especially in ductility, a property so necessary in copper trolley wire. After many adverse experiences in the use of the electric welding machine the process was abandoned and the old process of brazing with silver solder as used and is yet in vogue.

The reason for the failure of an electric welded joint of copper may not be apparent to some and is quite simple when we stop to consider. Electricity, as before mentioned, is so mysterious that many results are laid at its door without any attempt at an explanation. It usually is sufficient to say that the result is accomplished by the agency of the electric current and nothing further is required. To those who have watched the workings of the electric welding machine during the process of welding a copper wire it soon becomes apparent that the welding process is more a condition of melting than otherwise. The wire becomes heated by the current and the ends fuse together when the copper is melted. It is quite obvious then that a metal of the properties of copper must be greatly deteriorated by being melted in the open air. Even a careful melting in a crucible under a good layer of charcoal sensibly deteriorates its quality and it is evident then, that melting, for that is practically what the electric welding process is, must likewise deteriorate the quality, but in a far greater degree. The reason for this is the absorption of oxide, copper unlike most other metals having the property of dissolving its own oxide. If there were a method of welding the wire in an atmosphere which does not contain oxygen, such as carbonic acid gas, nitrogen or even a vacuum, it would undoubtedly obviate such an absorption of oxide and its accompanying production of brittleness in the wire.

SOFT VS. HARD TROLLEY WHEELS.

In the early days of the trolley car the first thought of the brass founder was to make a hard trolley wheel. His only idea appeared to be to make a wheel which would not wear out. Bell metal and other hard bronzes were used; indeed, in many instances, such hard alloys were produced that special steels had to be used to turn them. This condition now appears to have been changed. The axiom exists among the trolley companies, "That it is better to wear the wheel than the wire."

This is undoubtedly so, as a wheel is much more easily replaced than the wire, and the expense less. Such a reaction in regard to soft wheels having set in, works quite favorably for the maker as well as the consumer. The castings are cheaper and are worked more easily than the harder alloys, with the consequent reduction in price.

SILVER SOLDER.

Silver solder is one of the alloys which would be difficult to do without. Ordinary brazing solder, consisting of half copper and half spelter, is suitable for many purposes, but for others it is wholly worthless on account of its brittle nature. In cases where toughness is desired, together with a low fusing point, silver solder is used. The expense alone is responsible for its limited use compared with that of ordinary brazing solder, but its value is beginning to be realized and probably the consumption of silver solder is constantly increasing. As ordinarily made, it consists of two parts of fine silver and one part of high brass sheet (2 and 1). The brass sheet should be pure and free from tin and lead. If difficulty is experienced in obtaining it, copper and zinc should be used in its place. The solder in percentages is composed of:

Silver	66.66	per cent.
Copper	16.67	" "
Zinc	16.67	" "
Total	100.00	" "

Good high brass sheet is generally two parts of copper and one of zinc.

The Chicago Brass Manufacturers' Association and the Metal Polishers', Buffers', Platers', Brass Molders' and Brass Workers' International Union have come to an agreement which is to continue in force for one year, beginning March 14, 1903. By the agreement the number of working hours are reduced from 10 to 9, without a reduction in wages. There are to be no strikes or lockouts; all disputes are to be submitted to arbitration; overtime is to be paid at the rate of time and a half and double time paid for work on Sundays and holidays, and there is no restriction to the output of the factory. The provisions of the agreement are a compromise by the respective parties.

A charter has been granted by the State of New York to the Independent Labor League of America, an organization seeking to protect the interests of non-union workmen.

FORGING ALUMINUM BRONZE

By Erwin S. Sperry.

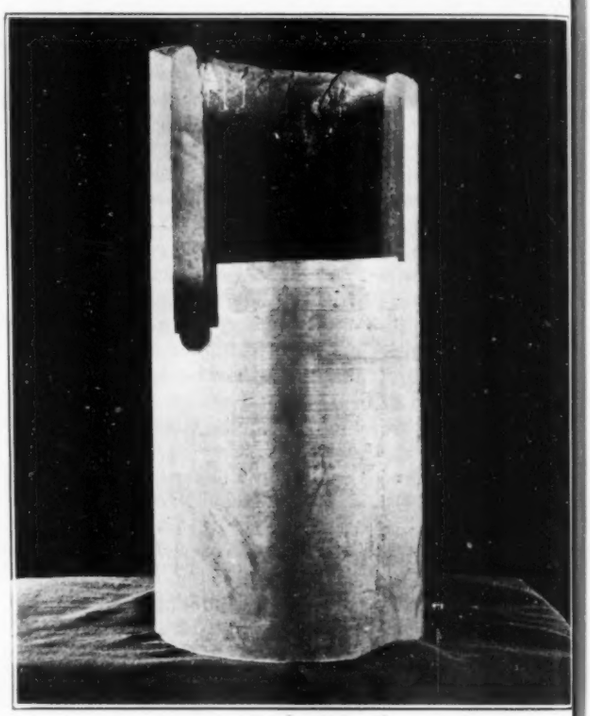
Aluminum bronze is unquestionably the most satisfactory copper alloy for hot-working that is known. Unlike the hot-working brass mixtures, it does not become brittle when the redness has disappeared (or black-short), so that no especial care is needed in the manipulation. With the hot-working brass mixtures, however, this one point must not be overlooked, otherwise the metal will crack to pieces. Were it not for this one fact perhaps the hot-working brass mixtures might easily be called better than aluminum bronze on account of their greater softness when at a red heat, but this one characteristic of being black-short renders them much more difficult to work. In its hot-working qualities aluminum bronze closely resembles good copper.

While aluminum bronze is not brittle at a low red or black heat, it is somewhat hard at this temperature, and in order to guard against possible cracking the reduction must be small. This is especially so in hot-rolling aluminum bronze billets, during the finishing passes, as the temperature is then necessarily much lower than the original rolling heat. Much difficulty is experienced in hot-rolling aluminum bronze on account of not allowing the billet to become sufficiently hot in the heating furnace. The most satisfactory temperature for this operation has been found to be a point just short of the melting heat, i.e., as near the actual melting point as possible and yet have the metal hold together. Indeed, I have seen billets which when removed from the heating furnace actually break in two and still each half roll perfectly during the roughing pass. By allowing the heat to reach this apparently high temperature the occasional difficulty of cracking during the roughing or breaking-down pass is to a certain extent avoided. To be sure, a billet of bad metal will crack at any heat, but it has been my experience that a much greater percentage of good work may be turned out when the initial heat has been as high as possible.

The same reasoning applies to copper, as it has long since been found that much better results are obtained by carefully heating the billet to its utmost capacity as regards the limits of temperature. I think this particular feature has been found to exist more in electrolytic than in lake brands; why, I cannot say. At any rate, a heater soon finds that much more satisfactory results are obtained when the heating temperature is high rather than low. In the early days of hot-rolled aluminum bronze the opposite was the case, and when metal became spoiled by cracking during the rolling the difficulty was assumed to be in the billet and not in the heating. It has been my experience that a billet which manifests any tendency to crack during the rolling will show it during the rough or breaking-down pass. After this operating has been completed the metal gives little trouble. I suppose the reason for this is the fact that a roughing pass is quite severe punishment for metal, and as the hotter the billet the softer it becomes, so that the plasticity is increased with the heat. At any rate, the fact is well known and borne out by considerable experience that the best results are to be obtained by a high initial temperature.

With metal rolled at a low temperature numberless small cracks often form on the surface. As the rolling becomes further advanced these cracks assume the shape of slivers or scales. The caster is often censured for having spilly metal in such instances, when, in reality, the heater is at fault. Fear, I think, is responsible for many cases of poor heating, for the workman anticipates the actual melting of the metal. Too fierce heating will, of course, injure the metal by lack of uniformity in the temperature of the billet, yet I have repeatedly seen aluminum bronze billets heated in a furnace used for heating steel billets, and with excellent results in rolling. In several cases, however, the outside of the billet was seen to melt and the liquid metal run down the side, due, of course, to the heat being too fierce, but the billet went through the roughing pass perfectly. Such heating, however, is not to be recommended, as uniformity is greatly to be desired. The most satisfactory heating of copper and copper alloy metal takes place when the temperature of the furnace is near the same as the required temperature and the heating brought gradually to the required end.

Aluminum bronze is an alloy of copper and aluminum containing up to 12 per cent. of aluminum. The more aluminum the alloy contains the harder it is, and the 12 per cent. alloy is the limit of usefulness. This percentage of aluminum produces an alloy which has no reduction of area or elongation. The alloys which contain only small amount of aluminum are only useful for cold-rolling purposes, as the softness is too great. For purposes requiring strength, the alloys containing from 9 to 12 per cent. of aluminum are used. If strength with much toughness is desired, the alloy of copper, 91 per cent., and aluminum, 9 per cent., is used. For general purposes the 10 per cent. alloy is used. When considerable stiffness is desired, the aluminum may be increased to 10.5 per cent. or even 11 per cent. The 12 per cent. alloy possesses no elongation at all, and is, therefore, only fit for special work. What alloy to use must be ascertained by the maker fitting the conditions. For ordinary forgings, however, we may say that the 10 per cent. alloy is the most suitable. All the alloys forge and roll hot equally well. Even the 12 per cent. alloy, which is very hard when cold, will roll perfectly as it becomes quite soft at a good red heat.



AN ALUMINUM BRONZE FORGING.

To illustrate the good forging qualities of aluminum bronze, a forging made some time ago by the Midvale Steel Company of aluminum bronze is illustrated. The alloy consisted of 91 per cent. of copper and 9 per cent.

of aluminum. The casting was made in an iron mold and poured from the bottom. The ingot, so cast, had the following dimensions: Base, 11 inches in diameter; top, 10 ⅜ inches in diameter; height, 14 inches. The ingot was forged in five heats. The forging, which is shown herewith, had the following dimensions, viz.: Length, 27 inches; inside diameter, 6½ inches; outside diameter, 9¼ inches. After being forged test bars were cut from it, both laterally and longitudinally, and gave the following results:

	Longitudinal.	Lateral.
Size, inches	2x2½	2x2½
Tension strength, per sq. in.	63,646	65,174
Elastic limit, per sq. in.	22,911	23,420
Elongation	49.8 pr. ct.	46.3 pr. ct.
Contraction of area	48.2 pr. ct.	47.0 pr. ct.

The forging cracked slightly at the end, but no more than steel would do under similar conditions.

AN OBSTACLE IN THE SCRAP METAL BUSINESS.

One would scarcely imagine that at this day of metallurgical experience the brass scrap dealer would become inveigled into purchasing steel at a price far beyond its actual value, but such is really the case. Always equipped with his pocket magnet, the junk man, while a thorough believer in the adage "that all is not gold that glitters," assumes without question that all which is not magnetic is not iron. An instance recently was revealed in which a deal was consummated in the sale of a quantity of *manganese steel* castings. These were sold and purchased for a nickel alloy, supposed to be quite high in nickel. The polished surface, to be sure, somewhat resembled nickel in color, and the metal was not magnetic. This latter property was the one which deceived the dealer. Manganese steel is not magnetic, and consists principally of iron with a small amount of manganese. It is used for the jaws of rock crushers, stamp shoes and dies, and similar work. It is so hard that it cannot be worked by any tools, and, at the same time, is exceedingly tough. There is a considerable quantity used, and more or less is sure to find its way into the scrap. The junk dealer will need to be on his guard, for his magnet will not aid him in such cases.

WOODS' METAL.

Woods' metal, composed of

Bismuth	4 parts
Lead	2 "
Cadmium	1 "
Tin	1 "

forms an alloy which will melt in hot water. In fact, the water need not be boiling, as the melting point is about 150° Fahr. It was a joke often perpetrated in the olden times to furnish guests with teaspoons made from this alloy and then watch the look of astonishment which came over their faces when the spoon melted in the hot tea.

Zinc and spelter are names which have been used indiscriminately for the same metal, and heretofore there appeared to be no distinction. At the present time, however, there seems to be a tendency to make a slight distinction between the two terms. Spelter is used to designat the common grades, while zinc is employed in naming the metal of the highest degree of purity.

The Akron Brass Company, of Akron, Ohio, will remove the plant of Albert L. Lambert, of Cleveland, Ohio, to Akron, and will build a brass foundry in Akron.

ROLL-NECK LUBRICANTS.

The roll necks of a rolling mill are something that need constant and good lubrication. The following mixtures have been patented in England by C. H. Risdale and A. Jones. It is claimed that these lubricants give excellent results:

HARD LUBRICANT.

Lime	3 parts.
Ordinary soap	6 parts.
Suet	75 parts.
Fine black lead	16 parts.

SOFT LUBRICANT.

Lime	2 parts.
Suet	45 parts.
Sulphur (fine)	4 parts.
Black lead	19 parts.
Heavy petroleum oil	30 parts.

CARBORUNDUM IN THE ROLLING MILL.

The slow and somewhat antiquated method of grinding the chilled rolls in brass and copper mills by means of a hardwood stick, emery and "elbow grease," is unsatisfactory in many respects, although it is the only method by which they can be ground in their proper position. It appears to be quite difficult to obtain the requisite "crown" on the roll if it is ground outside of the housings, especially if done on centers.

Always looking for improvement, some of the enterprising mill superintendents have substituted carborundum in place of emery and with excellent results. Diamond powder would be better still were it not for its enormous cost. Carborundum, however, is the hardest known substance, with the exception of the diamond, and as it is very much harder than emery, the reason for its value in roll grinding is obvious.

We cannot give the exact relation between the time it takes to grind a pair of rolls with carborundum and that necessary with emery, but we do know that there is a large saving in time when the former is used. Although carborundum is a little more costly than emery, the saving of time is sufficient to pay for the difference many times over.

We see no reason why carborundum should not be universally adopted in the brass and copper industry for roll grinding as soon as its value in this line is appreciated.

H. A. Taylor, Assistant Secretary of the Treasury, has reported adversely on the proposal to remove the New York Assay Office to Philadelphia. He recommends that the present building in Wall Street be sold for $2,000,000, or more, at which it is valued, and that another site be purchased. He thinks a suitable site may be secured east of Broadway, below Fulton street, for about $300,000, and a five-story building put up for a similar sum. It has always been a surprise that a plant for refining and parting gold and silver should actually be in existence in the most valuable section of New York City. None but a Government institution would be able to exist under such conditions.

Recent reports from London say that the entire British-Indian army is to be equipped with aluminum utensils. THE METAL INDUSTRY has reported from time to time what progress has been made in the equipment of certain Indian regiments with aluminum mess kits. The equipment of the entire Indian army will be beneficial to British aluminum interests.

A NEW METHOD OF IMPROVING GERMAN SILVER.

From the very beginning of the invention of German silver there has been an almost uninterrupted series of attempts to improve the quality of the metal. Probably no alloy has had so much attention paid to it, and to the metallurgical inventor the field appears to have been particularly alluring. There is no question that there has been much room for improvement, and many of the early white metals were, in reality, the counterpart of our present good grades of German silver. Of late years, however, the number of the so-called white metals have multiplied so rapidly and the results have been so nearly identical with those of good German silver that it is now a matter of doubtful business policy to attempt the sale of an improved white metal. Good German silver, as made by the leading manufacturers, is excellent material and ordinarily gives little trouble. To be sure, an occasional batch of refractory material is encountered, but, on the whole, little difficulty is experienced. It is not surprising then that so little interest is manifested in new white metals, as the consumer early discovers that they do not usually warrant the increase in price.

Up to the present time all methods of improving the quality of German silver have been based on the use of fluxes or the treatment of the metal in the crucible. A new and entirely novel process, however, has recently been discovered which is such a radical departure from the usual attempts to improve metals that not only is much credit reflected on the inventor for experimenting along such original lines entirely away from the beaten path, but a new and non-corrosive product is produced which has heretofore not been manufactured. This process is based on the treatment of German silver after it has been made into sheet metal. The sheet, spoon blank, or whatever the article may be, is then subjected to a special treatment by which a film of pure nickel is produced. German silver consists of copper, nickel and zinc, and the usual grade employed in the manufacture of flat-ware is known as 18 per cent. metal. It consists of copper, 62 per cent.; nickel, 18 per cent., and zinc, 20 per cent., so that in spite of the presence of the nickel German silver will tarnish from the presence of so much copper. By this new process of treating German silver the copper and zinc are removed from the "epidermis" of the metal, so to speak, so that a heavy surface of nearly pure nickel results.

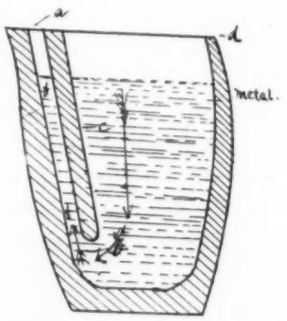
The process is not by any means a plating process, as one might at first fancy, but instead of adding anything to the weight of the metal something is actually taken away, so that in reality a piece of flat-ware is actually lighter after the treatment than before. The process may be likened to a case-hardening more than anything else, as there is left the hard, unyielding and non-corrosive surface of nickel, the properties of which are so well known and so thoroughly respected. Mr. Thomas B. Lashar, of the Holmes and Edwards Silver Company, of Bridgeport, Conn., is the inventor of the process, the details of which are at present kept secret, but which consist in removing the copper and zinc from the surface of the alloy and leaving only the nickel exposed. The non-corrosive properties of pure nickel are so well known that no further comment is necessary on this point.

The advance in the price of ingot copper has necessitated a corresponding increase in the price of sheet brass, brass wire, brass rod and tubing. Prices have been raised 15 per cent. within the last thirty days.

The Leather and Brass Manufacturing Company, of Auburn, N. Y., manufacturers of bicycle and automobile pumps, have moved into larger quarters.

A NEW FORM OF CRUCIBLE.

The Joseph Dixon Crucible Company, of Jersey City, N. J., has recently put upon the market a new form of crucible which is radically different from anything heretofore produced. The crucible enables metal to be poured from the bottom, and thus avoid any contamination with dross or charcoal, which oftentimes results when the usual form is employed. Bottom pouring has long been practiced in various ways, notably from ladles tapped from the bottom; but in this form of crucible there is no need of such a practice.



The crucible is simply one of ordinary shape, but with a tube leading down the side nearly to the bottom. The crucible is filled, melted and poured in the usual manner, but it is readily seen that the metal will take the direction of the arrows and come up the channel f f and pass out the lip a. The lip a is a trifle higher than the edge d, in order to prevent overflow when pouring takes place. The principle of bottom pouring needs no explanation, and the advantage is quite obvious. These crucibles have proven excellent in the pouring of such metals as babbitt and aluminum alloys, as well as in brass and bronze. They are also used in the silver industry, as the pouring from the bottom prevents the flux from entering the mold.

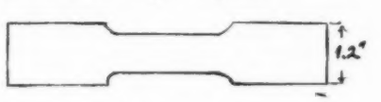
HEIDEL'S METAL.

The following report on this metal is quite interesting, as indicating the discovery by the inventor and the discovery by the testing machine, the latter, no doubt, being more or less disappointing. This report is taken from the "Tests of Metals" for 1901, just issued by the United States War Department. We herewith publish this report verbatim, viz.:

Heidels' metal, furnished by the Globe Electric Company, St. Louis, Mo.

Plate 6 in. by 6 in., lettered: Heidels' metal, discovered October, 1898. St. Louis, Mo., U. S. A.

Samples taken from edge of plate.



Mark.	Dimensions in.	Tensile strength per sq. in.	Elong. in 2.	Cont. area.
1.	.750 × .334	10,320 lbs.	11.0 per cent.	18.4
2.	.748 × .349	10,420 lbs.	11.0 per cent.	16.5

Light, silver-gray fracture. Amorphous, spongy near one surface.

A chemical analysis gave the following results:

Aluminum	99.20
Silicon	.48
Iron	.28

[This test and analysis indicates that the material was a casting of a poor grade of aluminum.—EDITOR.]

PRINTING DEPARTMENT.

In this department we will prepare articles on the subject of Printing from Metals in reply to any questions asked by our readers. Address THE METAL INDUSTRY, 61 Beekman Street, New York.

A. Mayer, New York, would like to know what kind of zinc or sheet tin should be used for flat surface printing, and if brass plate can be used.

The best sheet metal is that which has a certain porosity and consequent sensitiveness to grease; two metals so far fill the bill, one is sheet aluminum, the other is zinc; both answer very well. The aluminum sheet must be purchased from The United States Aluminum Printing Plate Company, New York. The zinc can be bought of any dealer; the best is the Belgian brand, and must, of course, be perfectly flat and cleaned according to the formulas published in previous issues of this journal. Fuchs & Lang, New York, sell prepared zinc for lithographic printing plates. Tin will not do for printing plates, neither will brass, as the work would soon wear off from the surface and the gum and etching preparation would not obtain a sound lodgement upon the surface.

FILM DESIGNS UPON ALUMINUM.

By E. F. Wagner.

To decorate aluminum surfaces with delicate tintings of stippel and line designs, it is only necessary to charge the transparent films with a strong etching ink, and after having thoroughly cleansed, from grease or finger marks, the surface of the plate, and having traced upon its face the outlines of the design and cut friskets of thin paper for the high lights, and pasted them in their proper places, the film, firmly set in its micrometer bearings, is laid down upon the plate and a gentle pressure upon its back by a roller is gone through, which will deposit the etching ink from the face of the inked up film to the plate; it will be found that every dot from the film will stand clear and sharp upon the metal. The gradation of certain parts, i. e., thickening of certain sections of the dots, is done by shifting the film a least bit to *one way*, and if further strengthening is required the shifting can be so arranged by the micrometer screws on the shading machine that a thickening of the dot the *other way* can be accomplished. All this can be done by inking and re-inking the plate and setting it back to its original place and while the film is thoroughly transparent the work and outline can be seen through it all the time while operation is going on. After the work is finished it is dusted over with powdered rosin and heated so as to fuse the rosin with the ink and combine all thoroughly to the metal.

The next operation is the etching of the design so as to either make a printing plate or prepare it for decorative purposes, such as gold plating, etc. To etch the aluminum plate in relief take protochloride of copper (the chrystalized green needles) and dissolve so much in water as to form a saturated solution without, however, creating a sediment; of this solution, which is of a deep green color, take 1 part to 6 of water, and add 1-10 of acetic acid to the liquid. This causes the mixture to change its color to a light blue.

Then moisten the aluminum plate carefully and pour enough of the chloride of copper mixture on to run to all parts of the plate. By this operation the muriatic (or hydrochloride) acid is liberated under the production of heats, and acts strongly upon the aluminum during this reaction, without, however, affecting the protected film design. With a broad bristle brush the acid is kept a moving, but same must be removed after each attack by a strong stream of water, using the brush to clear away the accumulated dregs of copper. The operation can be repeated several times, or it can be kept up in some places to deepen the design there, and stoppd in others by respectively covering with asphaltum. Finally concentrated nitric acid is applied, which is instantly to be followed by a stream of water; dry quickly. The aluminum plate, if so desired, is now ready for the gold plating which, according to Tissier, the eminent French electrochemist, is as follows.

Take 8 grammes of gold and dissolve same in sufficient nitroazotic acid, reduce the liquid with water and let it digest until the following day with a little surplus of lime. The deposit of oxide of lime and gold and the surplus of lime is then separated, well washed and under slight warmth treated with a solution of 20 grammes hypo-sulphurous soda in 1 quart of water.

With this liquid you can gild either in the cold process or with the assistance of a galvanic apparatus. If the latter method is employed on aluminum, the metal must be first prepared by biting it with soda lye (or potash lye) and finally with nitric acid, then washed in plenty of water and laid in the liquid.

The Aluminum Press Company, of New York, will put up a new plant near the sight of their present works at Plainfield, N. J. The company has secured twelve acres of land and will erect a main shop, 300 x 100 feet; a foundry, 100 x 200 feet, and a power house, 150 x 250 feet. Railroad tracks will run into each building, which will connect with the Central Railroad of New Jersey and the Lehigh Valley. The site of the new pant is but a short distance from the Plainfield Railroad Station.

Recent sales of presses of the Aluminum Press Company are: Two rotaries to the Goes Litho Company, of Chicago; one to Armitage & Ibbetson, Bradford, England; two to E. S. & A. Robinson, Bristol, England; two to Mardon, Son & Hall, Bristol, England; two to Tellotson & Son, Bolton, England; one to B. Taylor & Co.; Manchester, England, and one two-color press to the United States Lithograph Company, of Cincinnati, Ohio.

Recent sales of presses by Van Allens & Boughton, sole selling agents of the Huber rotary press, are: One to the Riverside Printing Company, Milwaukee, Wis.; one to Louis E. Newman & Co., New York, and one to the Hixson Map and Litho Company, Rockford, Ill. The new building of the Huber Company at Taunton, Mass., will be one-tenth of a mile long.

The Goldbeaters' Union, of New York City, are attempting to organize the women who are employed in the trade, against whom they struck a year ago. The strike was lost and the employers refused to discharge the women, some of whom have beeen with them for many years.

The International Silver Company has settled its differences with the United States Silver Company and C. Rogers & Bro., of Meriden, Conn., and the latter plant will now be conducted under the management of The International Company.

The United States Circuit Court of Appeals has decided that the 380 Spanish antique bronze cannons imported by R. F. Downing are dutiable as manufacturers' articles and not free as old copper.

THE PRODUCTION OF A BLACK COLOR ON BRASS.

By Erwin S. Sperry.

Much difficulty is often experienced by platers and other brass workers in the production of a satisfactory black color on brass. This would, perhaps, appear somewhat ridiculous inasmuch as brass will of its own accord oxidize to a black color if left for any length of time. Oxidized silver, which was much in vogue at one time, greatly stimulated the production of a similar finish on brass, and the same method was employed, but usually with unsatisfactory results. In the oxidation of silver the property of tarnishing by sulphur compounds is made use of, as the ready susceptibility of this metal to such influences is sufficient to render the process quite satisfactory. Silver is very easily blackened by sulphur and its compounds, and all that is necessary to do is to bring it in contact with a solution of potassium or sodium sulphide (liver of sulphur), when an immediate blackening takes place. The same method used on brass produces a black color, but not entirely satisfactory, as it is wanting both in color and in depth. If allowed to remain for a long time, in order to obtain a deep black, the coating does not appear to adhere, but scales off. These difficulties render the employment of sulphur compounds in blackening brass more or less unsatisfactory, and much trouble is found in their use. Those who have attempted their use have usually abandoned the method in favor of others.

The solution now generally employed for the production of a black or oxidized surface on brass is a solution of carbonate of copper in ammonia. The work is then immersed in it and allowed to remain until the required tint is produced. The carbonate of copper is best used in the so-called plastic condition, as it is then much more easily dissolved. Plastic carbonate of copper may be purchased, but if one wishes to make it the following method answers well: Make a solution of blue vitriol (sulphate of copper) in hot water, and add a strong solution of common washing soda to it as long as any precipitate forms. The precipitate is allowed to settle and the clear liquid poured off. Hot water is now added, and the mass stirred and again allowed to settle. Again the clear liquid is poured off, and the operation of adding water, settling and pouring off repeated. This is continued until everything has been washed out of the green carbonate of copper, which remains in the bottom of the vessel. Six or eight times is usually sufficient to remove the impurities. After the water has been removed during the last pouring and nothing is left but an emulsion of the thick plastic carbonate in a small quantity of water, liquid ammonia is added until everything is dissolved and a clear, deep blue liquid is produced. If too strong, water may be added, but I have found that a strong solution works better than a weak one. If it is desired to make the solution from commercial plastic carbonate of copper, the following directions may be followed: Dissolve one pound of the plastic carbonate of copper in two gallons of strong ammonia. This gives the required strength of solution.

The brass, which it is desired to blacken, is first boiled in a strong potash solution to remove grease and oil, then well rinsed and dipped in the copper solution, which has previously been heated from 150 to 175 degrees Fahrenheit. The solution does not work well cold, and if heated too hot gives off all of the ammonia. The brass is left in the solution until the required tint is produced. The color produced is very uniform and black. It also holds tenaciously and does not readily peel off. After the desired color is produced the brass is rinsed and dried in sawdust. A great variety of effects may be produced by first finishing the brass before blackening, as the oxidizing process does not injure the texture of the metal at all. A very satisfactory finish is produced by first rendering the surface of the brass matt, either by scratch brush or similar methods, as the black finish thus produced by the copper solution is then dead—one of the most pleasing effects of an oxidized surface. Various effects may also be produced by coloring the entire article and then buffing off the exposed portions.

The best results in the use of this solution are obtained by the use of the so-called red metals, i.e., those in which the copper predominates. The reason for this is quite obvious. Ordinary sheet brass consists of about two parts of copper and one part of zinc, so that the large quantity of the latter somewhat hinders the production of a deep black surface. Yellow brass is colored black by means of the solution, but if the very best results are desired it is well to use some metal having a reddish tint indication, the presence of a large amount of copper. The varieties of sheet brass, known as gilding or bronze, work well. Copper also gives excellent results. Where the best results are desired on yellow brass a very light electro-plate of copper before the oxidizing works well and gives an excellent black. With the usual articles made of yellow brass, however, this is rarely done, but the oxidization carried out directly.

THE RECOVERY OF COPPER FROM PICKLE OR DIPPING SOLUTIONS.

There are many instances where the copper present in pickle or dipping solutions may be readily recovered and become a source of more or less revenue to the manufacturer. The following method is one which is not only readily performed, but practically costs nothing but the labor involved:

Put the solution containing the copper in any convenient receptacle—tanks, barrels or vats. Place a quantity of wrought iron scrap in it and allow to remain for a day or so. The time depends upon the amount of iron which is used and the temperature of the solution. The more iron that is used, the more quickly the copper is precipitated. A warm solution also hastens the process. The copper is precipitated by the iron as a granular deposit, which falls to the bottom of the tank if the iron is shaken from time to time. When all the copper is removed from the solution, the iron will not show any indications of copper deposit. The liquid may then be siphoned off and the copper removed from the bottom. Having a fixed market value, the copper may be readily sold.

The theory of the process is simple—the iron takes the place of the copper and goes into the solution. The copper replaces the iron and separates out in the metallic state. Such metals as lead, zinc or nickel remain in the solution and are not separated out by the iron.

Many persons have not had good success with this method on account of using cast iron instead of wrought or soft steel. All cast iron contains a large amount of carbon, which interferes with the precipitation of the copper. Either soft steel or wrought iron should be used; preferably the latter. Wrought iron barrel hoops answer well, and are exceedingly cheap. They also present a large surface. Galvanized sheet clippings are also excellent. It is quite obvious that the iron should be free from grease.

As a flux for tinning malleable iron or similar work cottonseed oil is used in many New England establishments.

ELECTRIC HEATED URN.

Something new, made by the Geo. A. Ray Manufacturing Company, of Buffalo, N. Y., is the electric-heated urn shown in cut. The urn is constructed of heavy metal and is finely finished. It has a capacity of nine pints, and

with electric heat will boil water in a few minutes. Being ornamental, it can be placed on the sideboard or any conspicuous place. The urn has a silver lining, satin-finished, and the outside is finished either in a nickel or silver-plate.

The Howe Manufacturing Company, of Derby, Conn., one of the oldest pin manufacturing concerns in this country, has notified its fifty employees that at the end of the year it will pay them the same rate of interest on their earnings as savings banks pay on deposits. This is 4 per cent. and means that most of the employees will get a bonus of $20 or over. Some will receive as high as $60. This is the first concern in the Naugatuck Valley to divide profits with its employees. The company has never had a strike.

The selling staff of the Russell & Erwin Manufacturing Company recently presented the retiring president, George J. Leighton, with a beautiful silver loving cup in token of their esteem and appreciation. Mr. Leighton had been connected with the Russell & Erwin Manufacturing Company for forty years, having entered the company's employ as a boy. The Russell & Erwin factory is located at New Britain, Conn., and they have large salesrooms in Chambers street, New York.

THE INCORPORATION OF LABOR UNIONS.—The Metal Polishers', Buffers', Platers', Molders' and Brass Workers' Union, No. 73, of Wallingford, Conn., were incorporated on March 18 by the Connecticut Legislature. This is the first labor union to become incorporated in Connecticut, and is a surprise in view of recent opposition by other unions to such a step.

The National Metal Trades' Association have a long list of topics to be discussed at their convention to be held at the Iroquois Hotel, Buffalo, on April 1 and 2. The topics relate to labor questions and cover about every phase of that problem.

The Sessions Foundry Company, of Bristol, Conn., make a specialty of fine iron ingot molds.

CORRESPONDENCE DEPARTMENT

In this department we will answer the inquiries of readers who have shop and foundry problems in the working and casting of aluminum, brass and copper, their allied metals and alloys. Address all communications to THE METAL INDUSTRY, 61 Beekman Street, New York.

Q.—A correspondent asks for a good mixture for making white metal patterns which will solder readily.

A.—It is better to adapt the pattern metal to the solders than to attempt to make any special mixture for soldering. A white metal pattern must be hard enough to withstand more or less rough usage. An alloy of 80 parts of tin and 20 parts of antimony answers well, but many object to the expense of the tin. If a cheaper mixture is desired, an alloy of 80 parts of lead, 10 parts of antimony and 10 parts of tin may be used. If these alloys, however, are not tough enough the amount of antimony may be decreased. Patterns made from them may be readily soldered with soft solder (half and half). The alloys will also melt in an iron ladle, a necessary feature in pattern making.

Q.—A subscriber wishes to know in what proportion lead, antimony and zinc will combine. An alloy of the above metals was made, and the zinc was found on the outside and the lead inside. He thinks that his method of melting was wrong. He also wishes to know whether any special flux should be used in making an alloy of copper, lead and tungsten.

A.—Lead and zinc will not combine except in very small amounts. If equal parts of lead and zinc are melted together and poured into a mold, even after a thorough stirring just before pouring, the lead will be found at the bottom and the zinc at the top. The zinc at the top of the mold will contain a little lead, and the lead at the bottom will contain a small amount of zinc. Zinc will take up from one to two per cent. of lead before separation commences. Lead and antimony combine in all proportions, and zinc and antimony; but if lead is added in large amounts to zinc alloys separation invariably follows. No method of preventing it appears to be known.

In melting the alloy of copper, lead and tungsten borax forms a good flux. The nature of a flux is to prevent access of air and products of combustion, and, therefore, any covering which will melt will answer. Equal parts of fluor-spar and glass also make a satisfactory flux. but acts on the crucible. Common salt is also extensively used. Borax, however, is a very satisfactory flux, but is somewhat expensive.

Q.—A brass founder wishes to know what will reduce the dross on ingot brass to a minimum. He is also troubled with black sides on the ingots, and wants to make a clean-looking ingot.

A.—By the use of common salt as a flux in melting the brass the dross and waste may be kept down as far as possible, but a certain amount is sure to form. Black sides may be avoided to a certain extent by dumping the ingots while red-hot into cold water. Too much lead in the metal will also produce black surfaces. Use lard or fish oil on the molds and the condition will improve somewhat.

Green sand used in making sand castings is not, as many often believe, of a green color, but the term is used in the same sense that it is in connection with wood. Green wood is that which is wet with sap. Green sand is that which is moist. In practice two kinds of molding are followed, viz: Green sand or with the sand moist, dry sand in which the sand has been dried in an oven.

TRADE NEWS

The McCullough-Dalzell Crucible Company, of Pittsburg, Pa., make a phosphorizer of their own special pattern.

The Ajax Metal Company, of Philadelphia, have just installed three new magnetic separating machines built by the Dings Electro-Magnetic Separator Company, of Milwaukee, Wis.

Application has been made to the Connecticut Legislature by the Scovill Manufacturing Company, of Waterbury, Conn., to increase the company's capital stock from $2,500,000 to $5,000,000.

The Egnon-Evans Company, of Philadelphia, Pa., expect to triple their plant in the near future. They will then be able to keep up with their orders for their injectors, blowers and general brass castings.

The Cornell & Andrews Company, of Providence, R. I., informs us that the rumor in regard to their installing an electrolytic plant for parting gold and silver is unfounded, and that such an installation is not yet contemplated.

The Phosphor Bronze Smelting Company (Limited), of Philadelphia, have bought property, 130x168 feet, near their plant at 2200 Washington Avenue for the purpose of extending their works.

The Modern Iron Works, of Quincy, Ill., manufacturers of iron and brass goods, expect to double the force of employes before the close of the current year, the business in sight pointing toward such a necessity.

The Columbus Brass Company, of Columbus, Ohio., have increased their facilities considerably for the manufacture of a complete line of nickel-plated stall trimmings and brass railings.

The Keystone Zinc Company, of Bethlehem, Pa., have been incorporated with a capital of $100,000. Truman M. Dodson, Alan C. Dodson, Josiah Bachman, Charles M. Dodson and Garrett B. Linderman are the incorporators.

The New Haven Car Register Company, of New Haven, Conn., manufacturers of car registers and trolley wheels, have sold their business to the International Register Company, of Chicago, Ill., where the New Haven plant will be moved.

The Milwaukee Ornamental Metallic Manufacturing Company are giving special attention to high-grade phosphor bronze castings. They have just turned out some extra fine work in this line for the new bridges being built in Milwaukee. The bearings for each bridge weighed nearly two tons.

The United Wire and Supply Company, of Providence, R. I., successors to the Standard Seamless Wire Company and Burdon Wire and Supply Company, have issued a price list of their tubing in seamless brass, low brass, copper and seamless nickel silver tubing; also tubing in brazed brass, brazed bronze, brazed German silver, tapered tubes and silver solder

The Nordberg Manufacturing Company, of Milwaukee, Wis., are now doing their own brass casting.

The Zucker, Levett and Loeb Company, manufacturers of electro-platers' supplies at New York, have shipped recently to Great Britain two large plating dynamos.

The New Era Manufacturing Company, of Kalamazoo, Mich., says that the use of their "Metallic Phosphoro" prevents frothy and porous castings.

The plant of J. Bishop & Co., at Sugarstown, Pa., which was recently destroyed by fire, has been moved to Malvern, Pa. The firm manufactures platinum ware.

The Lefferts Galvanizing Works, 508 East Twentieth street, New York, have been incorporated under the same name with a capital stock of $75,000.

The C. G. Hussey Brass and Copper Rolling Mills, of Pittsburg, Pa., were badly damaged by fire on February 22. As soon as the insurance is adjusted the plant will be rebuilt.

A circular has been issued by the Empire Metal Company, Syracuse, N. Y., relating to their products, which include babbitt metal, solder, phosphor tin, spelter, lead, aluminum and bismuth.

The Babbitt-Richards Company, of Clayville, N. Y., have put up an addition to their mill, giving them about three times their former floor space. The company manufactures wire of all metals, excepting iron and steel.

The Gorham Manufacturing Company have purchased the building site at the corner of Fifth avenue and Thirty-sixth street, New York, and will erect a ten-story building to be used exclusively by themselves.

The W. J. Clark Company, of Salem, Ohio, are general sheet-metal workers and manufacture melting ladles of thick plate steel. The ladles are suitable for melting babbitt, etc.

The Torrington Manufacturing Company, of Torrington, Conn., manufacturers of special brass working machinery, report an excellent business at the present time. Their plant is filled with orders.

The plant of the G. I. Mix Company, at Galesville, Conn., was purchased at auction sale on March 24 by George Jessup, of the Winsted Edge Tool Company. The G. I. Mix Company were manufacturers of spoons and forks, and whether the plant will be operated along the same lines is yet unknown.

The Winchester Repeating Arms Company, of New Haven, Conn., have recently increased the capacity of their gas plant by the purchase of two 165-horse-power Westinghouse three-cylinder producer gas engines. The company's present equipment comprises about 500-horse-power in Westinghouse gas engine generator units and Loomis-Pettibone producers. The Winchester company operates its own brass rolling mill for the manufacture of cartridge metal, and is the first brass concern to utilize the gas engine for rolling-mill work.

TRADE NEWS

Dr. E. J. Soik and Albert Leyse, of Two Rivers, Wis., have formed a co-partnership and will manufacture aluminum signs and advertising novelties.

The Wagner Manufacturing Company, of Sidney, Ohio, are preparing a new catalogue, which will be ready for distribution in April. The company makes a specialty of aluminum castings.

A four-page circular on aluminum in various forms is being issued by Jannay, Steinmetz & Co., Drexel Building, Philadelphia. The circular relates to aluminum ingots, desiccated or "Saw Dust" aluminum, aluminum in the form of sheet and castings and aluminum solder.

A. B. Dwigans, of Shellsburg, Iowa, will soon put on the market a calendar made of aluminum. It is a perpetual calendar, is the size of a silver dollar, and consists of two stamped plates fastened in the center by a rivet.

The Government of Madras, India, have resolved to dispose of the aluminum business that it has been carrying on at the School of Arts, and has empowered Alfred Chatterton, the school's director, to negotiate with the Indian Aluminum Company, also of Madras, for the sale of the business conducted by the School of Arts.

The Fletcher Aluminum Company, of Springfield, Mass., received some time ago an order from the R. T. Booth Company, of Ithaca, N. Y., for 25,000 aluminum boxes, and the company has recently increased the order to 40,000. The Booth company reports that the aluminum boxes are a great advertisement for the sale of their product. The Fletcher company are getting out new designs in photo top boxes.

Mr. Emerson Davis has sold out his interest in the United States Aluminum Castings Company, of Cincinnati, Ohio, and has taken over their brake patents. Mr. Davis is in a position to locate his aluminum foundry business in the East, including the manufacture of his roller brake, and would like to correspond with interested parties. His address is 1517 Blue Rock street, Cincinnati, Ohio.

SALVE KNIFE.

The New Jersey Aluminum Company, of Newark., N. J., have received an order for 125,000 spatulas or salve knives shown in cut. The spatula was made from a carefully devised model, and its curves are adapted to those of the human body, and permits of a ready application of any salve or medicinal preparation. Doctors and nurses pronounce it a handy tool. The knife is made out of heavy stock and has much more regidity than the ordinary stamped aluminum article. The spatulas were ordered by the Denver Chemical Manufacturing Company, of New York, who distribute them for advertising their preparation, "Antiphlogistine."

The plant of the Steel and Iron Aluminum Coating Company, South Connellsville, Pa., which has been idle for some time while new machinery was being installed, has again resumed operations.

The Aluminum Cooking Utensil Company, of Pittsburg, Pa., have issued catalogue No. 4, which supersedes all others previously issued. A new price list has also been issued, but the prices are practically the same as those mentioned on former lists. In appearance the catalogue is similar to others of the company, with the omission of a number of utensils for which there has been a little demand and the addition of a few for which there is a general market. The catalogue shows the articles which the company have found to be the best sellers in all parts of the country. The company does not guarantee to supply any utensils not listed in catalogue No. 4. By operating their factory on the utensils mentioned only in the new catalogue the company believe that they will be able to ship all orders promptly and completely.

POCKET MIRROR.

The Aluminum Manufacturing Company, of Two Rivers, Wis., are putting on the market the pocket mirror shown in cut. The back is of sheet aluminum, and it can be made plain or stamped with advertising matter. Like the pocket match safe, pocket paper-cutter, pocket pencil, the mirror will be found a useful adjunct to pocket trinkets.

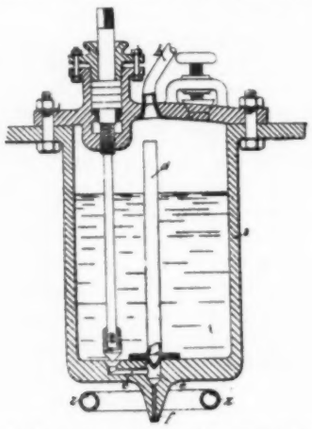
NEW FLORENCE LINE.

The holiday line of the Florence Manufacturing Company, of Florence, Mass., is on exhibition at their New York salesrooms, 621 Broadway. As usual, the company have brought out many new designs, and their display this year is more attractive than ever. They are showing aluminum brushes and trays in a great variety of finishes, including satin finish, black enameled, embossed, French gray, and something new this year are brushes with enameled center and aluminum border; also sets with the pearl center, silver and burnt-wood border. Some sets are put up in fancy half-round boxes. The trays are made both in the oval and square shape. Besides these, "Cosmeon" goods, which include trays, brushes and mirrors, the company manufactures a fine line of mountings in silver and gold plate, with all of the varied finishes which are now put upon these metals, and also pearl mountings. As an exhibition of fine finishing of aluminum goods and goods in other metals, the Florence Manufacturing Company's line is worthy the attention of the dealer and the manufacturer.

PATENTS

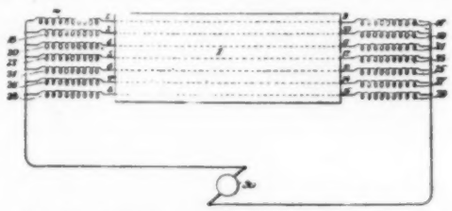
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

719,725, Feb. 3, 1903. PROCESS OF PULVERIZING METALS. Camille Bertou, Paris, France. A process for the pulverization of readily-



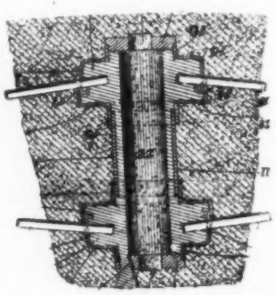
fusible metals, which consists in forcing the fused metal to flow under the action of a strong pressure exerted upon it, utilizing the elastic force of the fluid itself and forcing it to mingle with a current of elastic fluid under pressure with which it forms a jet, the sudden expansion of which causes the pulverization of the metal.

719,507, Feb. 3, 1903. ELECTRIC FURNACE.—Henry N. Potter, New Rochelle, N. Y., assignor to George Westinghouse, Pittsburg,



Pa. An electric furnace, consisting of a tube composed of a mixture of dry electrolytes and provided with confronting electric-circuit terminals arranged in pairs at its opposite ends, each pair of terminals being in series with a separate ballast device.

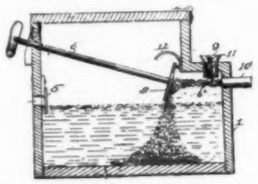
719,744, Feb. 3, 1903. METHOD OF CASTING AND ARTICLE MADE THEREBY.—Clinton D. Cannon, Battle Creek, Mich., assignor of one-third to Corodon S. Cannon, Battle Creek, Mich. An article



of the class described comprising an outer metallic sheathing formed of sections, certain of said sections having openings there through spokes passed through the openings, and a filling cast within and contracting with the sheathing and the spokes, said filling and sheathing being fused together and holding the sections against relative movement.

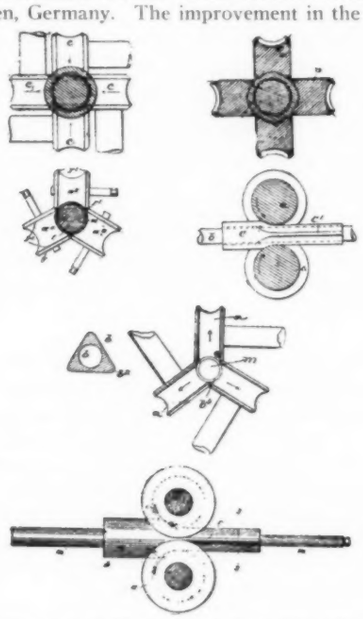
721,171, Feb. 24, 1903. WRAPPING MATERIAL FOR PREVENTING TARNISHING OF METAL ARTICLES.—Frank Flor and Ernst Murmann, Vienna, Austria-Hungary. A means for protecting metal articles against dimming, the said means consisting in packing or wrapping material which is impregnated with ammoniated cupric hydroxid.

721,293, Feb. 24, 1903. APPARATUS FOR THE DISINTEGRATION OF METAL.—Maximilian J. Fuchs, Stamford, Conn., assignor to the Baer Brothers, New York, N. Y. An apparatus of the class de-



scribed, comprising a tank, a pipe for projecting a stream of water therein, said pipe having a single discharging-orifice of angular shape, whereby the stream projected from said pipe is of solid angular cross-sectional area, means for guiding molten metal to said stream to be intercepted by the latter and supported thereby, and an impinging-surface arranged in said tank opposite to said pipe and against which the molten metal is forced by said stream of granulating said metal.

721,209, 721,210, 721,211, 721,212, 721,213, 721,214, — Feb. 24, 1903. ART OF ROLLING TUBES.—Max Mannesmann Remscheid-Bliedinghausen, Germany. The improvement in the art of rolling



tubes, which consists in subjecting the hollow blank or billet of a size larger than the pass on a mandrel to the pressure of positively driven rolls, which first contact with or compress the metal near the edges of the groove, so as to stretch it in longitudinal direction into a tube, and to compress the same around the entire circumference of the mandrel, substantially as set forth. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a mandrel by rolling tools, squeezing down parts of the material of the blank in the open space between the rolling tools, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolling tools, and the fins, feathers, ribs or ridges in the open space between the rolling tools, substantially as described.

721,053, Feb. 17, 1903. CLEANING AND POLISHING COMPOUND.—Philip Levi, Brooklyn, N. Y. The herein described process of making a cleansing and polishing composition, which consists in mixing paraffin oil and water, and adding thereto trichlorid of antimony whereby oxychlorid of antimony in a finely divided state is precipitated, and free hydrochloric acid is formed, said oil and acid forming the cleaner, and the said finely divided oxychlorid of antimony constituting the polisher, substantially as set forth.

Metal Prices, April 4, 1903

METALS.

	Price per lb.
TIN—Duty Free.	
Straits of Malaca	30.00
COPPER, PIG, BAR AND INGOT AND OLD COPPER— Duty Free. Manufactured 2½c. per lb.	
Lake	15.12½
Electrolytic	15.00
Casting	14.50
SPELTER—Duty 1c. per lb.	
Western	5.65
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.70
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	8.25
Hallets	7.00
Other	6.75
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 60
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.49¼
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask	47.00

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Above prices are for lots of not less than 500 pounds.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS.

	Buying.	Selling.
Heavy Cut Copper	12.00c.	13.50c.
Copper Wire	11.75c.	13.00c.
Light Copper	11.00c.	12.00c.
Heavy Mach. Comp	11.75c.	13.00c.
Heavy Brass	8.00c.	9.00c.
Light Brass	6.75c.	7.50c.
No. 1 Yellow Brass Turnings	8.00c.	8.75c.
No. 1 Comp. Turnings	10.75c.	11.50c.
Heavy Lead	4.30c.	4.50c.
Zinc Scrap	4.10c.	4.20c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.

PRICES OF SHEET COPPER.

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet. 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	20	21	21	21	21	22
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	22
	Longer than 96 ins.	20	21	21	21	21	23
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	20	21	21	21	21	23
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	23
	Longer than 96 ins. Not longer than 120 ins.	20	21	21	21	22	24
	Longer than 120 ins	20	21	21	22	23	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	20	21	21	22	23	25
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	22	24	26
	Longer than 96 ins. Not longer than 120 ins.	20	21	21	23	25	29
	Longer than 120 ins.	20	21	22	24	27	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	20	21	21	22	24	27
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	23	25	30
	Longer than 96 ins. Not longer than 120 ins.	20	21	22	24	27	
	Longer than 120 ins	21	22	23	25	29	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	20	21	22	24	29	
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26	31	
	Longer than 120 ins.	21	22	24	29		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	21	22	24	27		
	Longer than 96 ins. Not longer than 120 ins.	22	23	25	28		
	Longer than 120 ins.	23	24	26	30		
Wider than 108 ins.	Not longer than 132 ins.	24	25	27			
	Longer than 132 ins.	25	26	29			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Metal Prices, April 4, 1903

PRICE LIST FOR ROLL AND SHEET BRASS.

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 35 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE.

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, In	$0.23	$0.27	$0.31
Above No. 10 to No. 16..	.23½	.27½	.31½
Nos. 17 and 18.....	.24	.28	.32
" 19 and 20.....	.25	.29	.33
No. 21.....	.26	.30	.34
" 22.....	.27	.31	.35
" 23.....	.28	.32	.36
" 24.....	.30	.34	.38

Discount, Brass Wire, 35 per cent.; Copper Wire, net.

PRICES FOR SEAMLESS BRASS TUBING.

From 2 in. to 3¾ in. O. D. Nos. 4 to 12 Stubs Gauge, 19c. per lb. Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size.....	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.....	33	29	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING.

Brown & Sharpe's Gauge the Standard.

												Per lb.
Plain	Round	Tube,	¾	in.	up	to	2	in.,	to No.	19,	inc.	$0 35
"	"	"	⅞	"	"		¾	"	"	19,	"	36
"	"	"	1	"	"		⅞	"	"	19,	"	38
"	"	"	1⅛	"	"		1	"	"	19,	"	41
"	"	"	1¼	"	"		1⅛	"	"	19,	"	48
"	"	"	1⅜	"	"		1¼	"	"	19,	"	65
"	"	"	1½	"	"		1⅜	"	"	19,	"	1 00
"	"	"	1⅝	"	"		1½	"	"	19,	"	1 50
Smaller than ⅛ inch.....												Special
2 inch to 3 inch, to No. 19, inclusive												38
3 inch.....												40
Over 3 inch to 3½ inch.....												45
Over 3½ inch.....												50

Bronze and copper, net advance 3 cents.

ALUMINUM.

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No 11	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.

PRICE LIST FOR SHEET ALUMINUM.

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than.. And Including..	3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier.		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 14		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 15		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 16		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 17		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 18		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 19		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 20		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 21		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 22		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 23		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 24		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 25		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 26		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 27		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 28		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 29		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 30		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 31		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 32		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 33		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 34		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 35 & 36		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 37 & 38		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" 39 & 40		42	44	44	44	44	47	47	47	46	48	50	55	2	6
" .003" to .0015"	67	46	46	46	46	46	49	49	49	48	50	52	57	2	6
Less than .0015"	98	48	48	48	48	48	51	51	51	50	52	54	60	2	6
	33	49	50	50	50	50	53	53	53	52	54	56	62	2	6
	42	50	52	52	52	52	55	55	55	54	56	58	64	2	6
	42	52	54	54	54	54	57	57	57	56	58	60	66	2	6
	06	54	56	56	56	56	59	59	59	58	60	62	68	2	6

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in. All columns except the first are for Flat Rolled Sheets.

Polished two sides double above prices.
Satin Finish two sides double above prices.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds.....	10 per cent. off list.				
1,000 to 2,000 "	10	per cent. and	2	per cent.	
2,000 to 4,000 "	10	" "	3	"	"
4,000 pounds and over	10	" "	5	"	"

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4.....	.....	.....	.....	10	9	8	7	1-4
5-16.....	.....	.....	.....	11	9	8	7	5-16
3-8.....	.....	.....	.....	12	9	8	7	3-8
1-2.....	.....	.....	17	14	11	9	8	1-2
5-8.....	.....	.....	21	16	13	12	.....	5-8
3-4.....	.....	.....	25	19	16	14	.....	3-4
7-8.....	.....	.....	28	22	18	16	.....	7-8
1.....	.....	.....	30	25	21	19	.....	.....1 00
1 1-4.....	.....	.....	36	30	25	.....	.....	.....1 1-4
1 1-2.....	.....	52	43	35	28	.....	.....	.....1 1-2
1 3-4.....	.....	60	50	41	33	.....	.....	.....1 3-4
2.....	84	68	58	47	37	.....	.....	.....2 00

Orders of 100 to 500 feet 20 per cent. discount.
Orders of 500 feet or over 30 per cent. discount.
Cutting to exact length 15 per cent. additional.

Sawed bars in widths less than 2 inches, an additional charge of 6 cents over the cost of sheet Aluminum; in widths of 2 inches and over, additional charge of 3 cents over the price of sheet Aluminum.

Sheet Lead, 7¾c. per lb., 20% off.
Lead Pipe, 7⅛c. per lb., 20% off.
Zinc—Duty, Sheet, 2c. per lb., 600 lb. casks, 7.15c. per lb.

All columns except the first are for Flat Rolled Sheets.